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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

VU, HUNG K

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 04/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/598,736

Applicant(s)

TAKAYAMA ET AL.

Examiner

Hung K. Vu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-63 is/are pending in the application.
- 4a) Of the above claim(s) 53-63 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-52 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 27 July 2000 is: a) ☒ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 11.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Request for Continued Examination***

1 A request for continued examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicants' submission filed on 01/23/03 has been entered. An action on the RCE follows.

### ***Claim Objections***

2. Claims 2-3, 5-15, 17-27, 29-39 and 41-51 are objected to because of the following informalities: In claims 2-3, 5-15, 17-27, 29-39 and 41-51, line 1, "A" should be changed to "The" for clarity. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4, 6-11, 13-16, 18-27, 40, 42-47 and 49-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oikawa et al. (PN 4,770,948, of record) in view of Prall et al. (PN 5,341,016).

With regard to claims 1, 4, 40, Oikawa et al. discloses the invention substantially as claimed, including a semiconductor device, the semiconductor device comprising,

wirings (5) formed over a substrate (1), the wirings comprising a tungsten film,

wherein the wirings include at least one inert element, and 90% or more of the inert element is argon, and

wherein an amount of sodium contained within the wirings is equal to or less than 0.3 ppm.

Oikawa et al. does not specifically disclose a tungsten nitride film formed under the tungsten film. However, Prall et al. discloses the wiring comprising a tungsten film (34) and a tungsten nitride film (33). Note Figures 5 and 7, and Col. 5., lines 1-20 of Prall et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the wirings of Oikawa et al. having a tungsten nitride film under the tungsten film, such as taught by Prall in order to improve the adhesion between the wiring and a gate dielectric film.

With regard to claims 2, 3, 9-11, 13, 21-23, 25, 45-47, 49 and 52, although Oikawa et al. and Prall et al. do not teach the thickness of the tungsten nitride film and the tungsten film, the electrical resistivity and the internal stress, the line width, the resistance, and the thickness of the wiring, as that claimed by Applicants, however, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the wiring having a desired

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thickness, resistivity, internal stress, line width, or resistance, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

With regard to claims 6-8, 18-20, 40 and 42-44, although Oikawa et al. and Prall et al. do not disclose other inert element (Xe or Kr) is contained within the wiring at an amount equal to or less than 0.1 atom% or an amount of oxygen contained within the wiring is equal to or less than 1 wt%. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the wiring having a desired amount of other inert element or oxygen, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

With regard to claims 14, 15, 24, 26, 27, 50 and 51, Oikawa et al. and Prall et al. do not disclose the semiconductor device is an active matrix type liquid crystal display, an active matrix type EL display, or an active matrix type EC display, or a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer, or a portable information terminal. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate the device of Oikawa et al. and Prall et al. into the devices as claimed in order to perform the desire function.

With regard to claim 16, Oikawa et al. does not disclose an insulating film comprising SiOxNy formed over the wiring. However, Prall et al. discloses an insulating film (21) comprising

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SiOxNy formed over the wiring. Note Figures 5 and 7 of Prall et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a cap layer over the wiring of Oikawa et al., such as taught by Prall et al. in order to increase the adhesion of the wiring and to protect the wiring during etching.

4. Claims 5, 12, 17, 28-39, 41, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oikawa et al. (PN 4,770,948, of record) in view of Prall et al. (PN 5,341,016, of record) and further in view of Ikeda et al. (JP8-153722, of record)

With regard to claims 5, 12, 17, 41 and 48, Oikawa et al. and Prall et al. disclose the invention substantially as claimed, including the device as cited in the rejections of claims 4, 16, 28 and 40, the wiring is used as a gate of the MOS with the gate insulating film (4). Oikawa et al. and Prall et al. do not disclose the wiring is used as a gate electrode of a TFT. However, Ikeda et al. discloses the wiring is used as a gate electrode of a TFT or MOS with a semiconductor film (104). Note Figure 13 of Ikeda et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the wiring of Oikawa et al. and Prall et al. as the gate electrode for the TFT, such as taught by Ikeda et al. in order to increase the circuitry density.

With regard to claims 28, Oikawa et al., Prall et al. and Ikeda et al. disclose the invention substantially as claimed, including the wiring comprising the semiconductor film (104), wherein the semiconductor film comprising n+ doped silicon (103a,103b). Oikawa et al. and Prall et al. do not specifically disclose n+ doped is phosphorus. However, it is well-known in the

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semiconductor art that phosphorus is commonly used to dope the silicon to in order to form the source and drain regions of the transistor.

With regard to claims 33-35 and 37, although Oikawa et al., Prall et al. and Ikeda et al. do not teach the thickness of the tungsten nitride film and the tungsten film, the electrical resistivity and the internal stress, the line width, the resistance, and the thickness of the wiring, as that claimed by Applicants, however, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the wiring having a desired thickness, resistivity, internal stress, line width, or resistance, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

With regard to claims 30-32, although Oikawa et al., Prall et al. and Ikeda et al. do not disclose other inert element (Xe or Kr) is contained within the wiring at an amount equal to or less than 0.1 atom%. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the wiring of Oikawa et al., Prall et al. and Ikeda et al. having other inert element at an amount equal to or less than 0.1 atom% in order to control the crystal structure of the wiring so that the resistivity of the wiring would be reduced. Further, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

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With regard to claims 38 and 39 Oikawa et al., Prall et al. and Ikeda et al. do not disclose the semiconductor device is an active matrix type liquid crystal display, an active matrix type EL display, or an active matrix type EC display, or a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer, or a portable information terminal. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate the device of Oikawa et al. and Prall et al. into the devices as claimed in order to perform the desire function.

### *Response to Arguments*

5. It is argued, at page 9 of the Remarks, that cited reference do not disclose the wiring comprising a tungsten nitride film and a tungsten film formed thereon. This argument is not convincing because Oikawa et al. discloses the invention substantially as claimed, including a wiring comprising a tungsten film (5). Oikawa et al. does not disclose the wiring comprising a tungsten nitride film and a tungsten film. Prall et al., on the other hand, discloses the wiring comprising a tungsten film (34) and a tungsten nitride film (33). Note Figures 5 and 7 Prall et al..

### *Conclusion*

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (703) 308-4079. The examiner can normally be reached on Mon-Thurs 7:00-4:30, alternate Friday 7:00-3:30, Eastern Time.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

April 3, 2003

Hung Vu